

MySQL Databases

An introduction for the novice

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What is a Database?

- Store information(data) in a reliable, accessible way
- Allow access to data over a network to multiple users
- Provide easy way to select a specific “view” of the data

Relational Database

- A relational database is a collection of tables that can be dynamically (and temporarily) combined into a single table. Columns of the contributing tables can be related to one another.
- In a non-relational database, the tables are always separate entities

A Few Terms:

- **Server** - Program that accepts connections and implements the database
- **Database** - A collection of tables on a single server. More than one “database” can exist on a single server
- **Table** - A set of column definitions

A Few Terms:

- **Column** - Provides a name and data type
- **Row** - A single entry in a table. It contains one value for every column (possibly NULL)
- **Query** - A command in SQL syntax for the database. It can insert, modify, or extract data.

M y S *tructured* Q *uery* L *anguage*

ANSI/ISO
Standard:
1992
1999
2003

SQL: Structured Query Language

- SQL is a syntax for probing and manipulating a database.

Creating a table

```
CREATE TABLE IF NOT EXISTS friends(  
    id          int PRIMARY KEY AUTO_INCREMENT,  
    firstname   char(255) NOT NULL,  
    lastname    char(255),  
    pets_name   char(255),  
    age         int,  
    status      ENUM("like","hate") default 'like',  
    created     datetime,  
    modified    timestamp  
) TYPE=MyISAM;
```

The INSERT statement

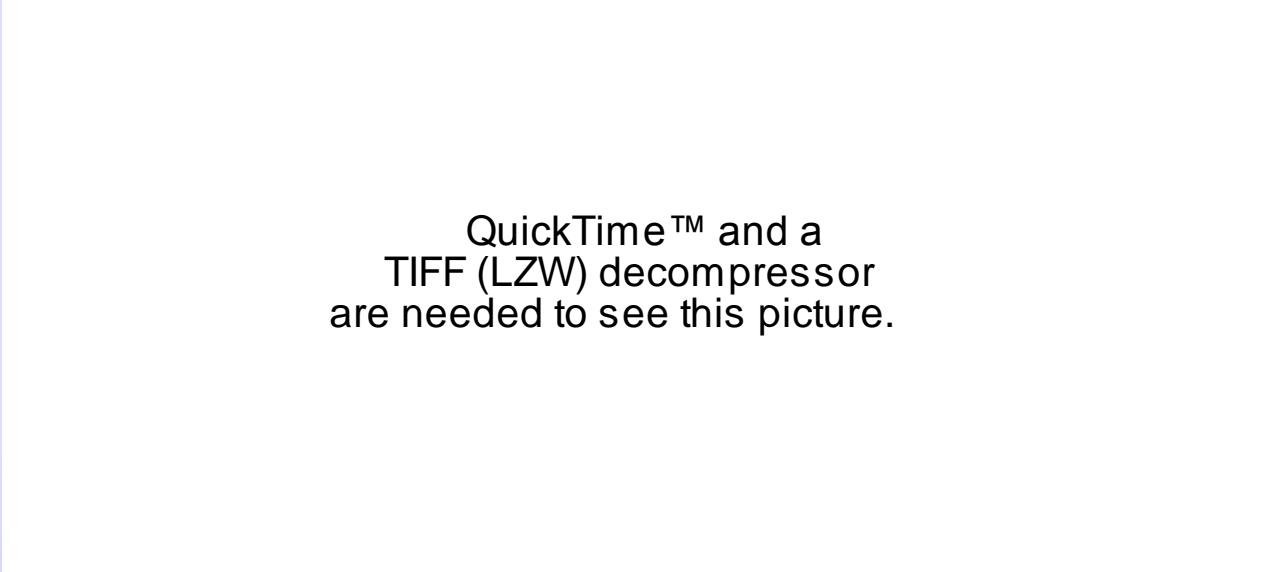
```
INSERT INTO friends  
  (firstname, lastname, pets_name, age, created)  
VALUES("Amelia", "Lawrence", "Star", 8, NOW());
```

The SELECT statement

QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

The SELECT statement

SELECT can specify both columns and rows...



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The SELECT statement

SELECT can limit the number of rows returned...

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The SELECT statement

SELECT can also be used with functions...

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The SELECT statement

SELECT can do math ...

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UPDATEing table data

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The DELETE statement

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Database Table Design is an Art!

```
# ---- BAD -----
```

```
CREATE TABLE IF NOT EXISTS tagger_e_cal_days3(
```

“If you have to do more than one query to get the data you want out of the database, you have not done a good job designing your tables.”

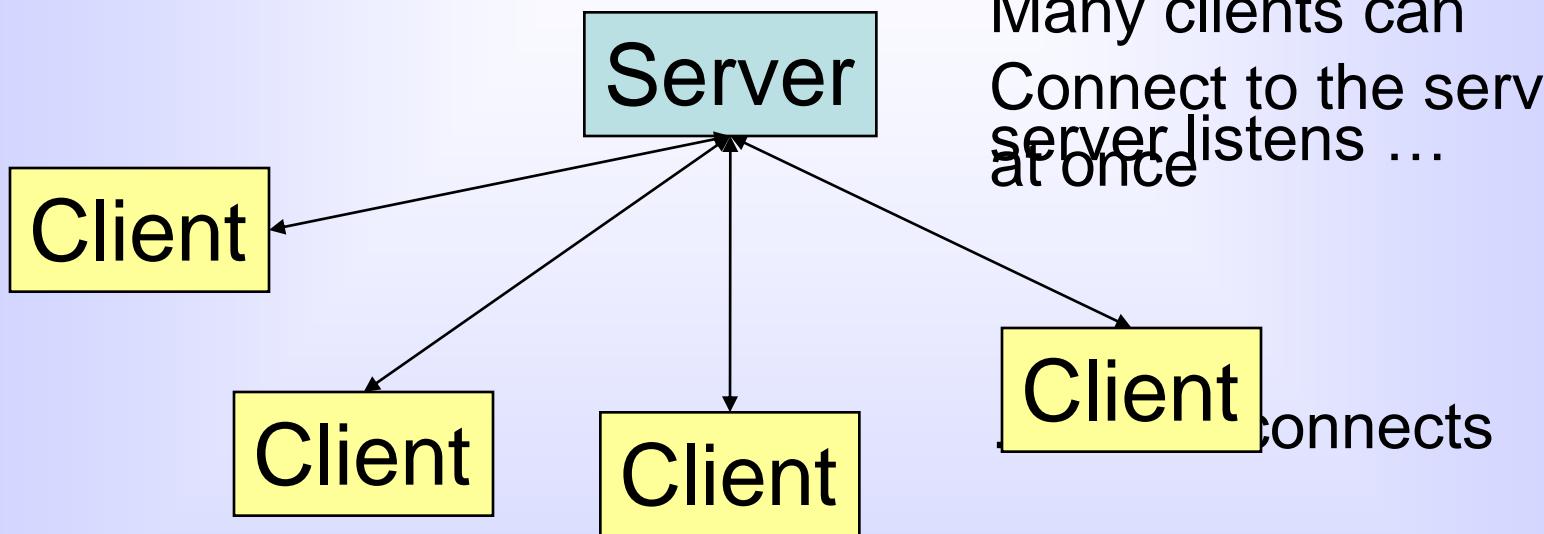
-R. Chapman, Professional Database Designer

```
    tagger_e_cal_table      char(255)
);
```

Database Table Design is an Art!

```
# ---- GOOD -----  
CREATE TABLE IF NOT EXISTS tagger_t_cal(  
    run          int NOT NULL,  
    tid          int NOT NULL,  
    toffset_l    int,  
    toffset_r    int,  
    PRIMARY KEY(run,tid)  
);
```

Client/Server Model



Permissions/Access Control

- Permissions are kept by server independent of any Unix system
- Accounts are determined by the host you connect from and the username *you supply*
- Permissions can be granted at the **global**, **database**, **table** and **column** levels
- Permissions can be granted for all or only a partial set of commands

Permissions/Access Control

- Use the GRANT and REVOKE commands to set permissions:

```
GRANT ALL PRIVILEGES ON test.* TO  
joebob@'%.jlab.org' IDENTIFIED BY "tutu"
```

```
REVOKE ALL PRIVILEGES ON test.* FROM  
joebob@'%.jlab.org' IDENTIFIED BY "tutu"
```

The *mysql* command-line tool

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API: Application Programming Interface

- The API provides the means to access the database from your language of choice
 - C
 - Perl
 - PHP
 - Java (JDBC)
 - Python
 - Tcl
 - Eiffel

C API

- Very useful for adding database access to C programs, but most jobs are better done in scripting languages
 - mysql_init()
 - mysql_real_connect()
 - mysql_query()
 - mysql_store_result()
 - mysql_fetch_row()
 - mysql_free_result()
 - mysql_close()

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Compiling the C program

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Perl API

- Uses the ***DBI*** and ***DBD-mysql*** modules
 - DBI->connect()
 - prepare()
 - execute()
 - fetchrow_arrayref()
 - fectrow_hashref()
 - disconnect()

Perl API

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PHP API

- The PHP interface is extremely valuable for interfacing a MySQL database with a web page
 - mysql_connect()
 - mysql_select_db()
 - mysql_query()
 - mysql_fetch_array()
 - mysql_close()

PHP API

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Java API

- Java uses JDBC to interface to MySQL
 - Class.forName()
 - getConnection()
 - createStatement()
 - executeQuery()
 - next()
 - getString()
 - getInt()

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Backing Up: *mysqldump*

- The mysqldump command line utility can print the entire contents of a database to the screen.
 - -*d* option says *don't* include table data
 - -*t* option says *don't* include table definitions
 - Individual tables can be specified

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Supported Platforms

- AIX
- Amiga
- BSDI
- Digital Unix
- FreeBSD
- HP-UX
- Linux
- SunOS
- True64
- Mac OS X
- NetBSD
- Novell Netware
- OpenBSD
- OS/2 Warp
- SCO Unix
- SGI
- True64
- MS Windows

Summary

- MySQL is a popular, free database well suited to most applications
- There are APIs supporting many programming languages including PHP which makes a powerful combination for generating web pages

See more at <http://www.mysql.com>